

BNF FOR INCREASED CROP PRODUCTION FOR SMALLHOLDERS (ZIM/5/009) D1

New

MODEL PROJECT

CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US \$	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1997	2/12	31,680	0	55,000	6/0	18,900	0/0	0	0	0	0	105,580
1998	1/28	26,970	0	40,000	9/0	29,700	0/0	0	0	0	0	96,670

First Year Approved: 1997

OBJECTIVES: To promote, through on-farm demonstration trials, the use of rhizobial legume biofertilizers in order to increase legume production and improve soil nitrogen economy through use of legumes in smallholder farming systems.

BACKGROUND: In Zimbabwe, over 70% of the population live in rural areas with agriculture as the main source of income. The smallholder farming sector covers about 50% of the total agricultural land, involving over five million people, about 90% of the farming community, and has a very low level of crop production. Government plans emphasize rural development as the basis for alleviation of poverty and for improvement of living standards. To maintain national food security and to sustain economic growth through increased export earnings and increased inputs in the manufacturing sector, the Government is particularly committed to increasing productivity in the communal areas. To achieve this, research and extension are expected to play a major role in delivering suitable technologies more closely matched to farmers' needs. Communal areas are mostly located in the agricultural marginal zones of Zimbabwe (Ecological Zone or Natural Regions III-V) which are characterized by low and erratic rainfall and poor quality soils. The level of crop production in these areas is low, mainly owing to inadequate nitrogen and phosphorus fertility. Low soil fertility can be overcome through the application of chemical fertilizers, but small scale farmers cannot afford enough of the fertilizers owing to prohibitive prices. However, legumes, because of their symbiotic association with *Rhizobium*, have the capacity to fix atmospheric nitrogen in substantial amounts and are able to produce high yields without the application of costly nitrogenous fertilizers. Also, cereals grown in rotation following legumes can derive benefit from nitrogen fixed by legume crop, leading to substantial savings in fertilizer input costs. Research conducted in Zimbabwe over several years has shown that a good legume crop can supply between 50% and 70% of the nitrogen requirement of a cereal crop following the legume crop. In trials carried out by the Department of Research and Specialist Services on a limited number of sites in the communal areas, application of *Rhizobia* inoculants more than doubled soybean grain yield; inoculants (costing a few dollars per hectare) performed better than 145 kg per hectare of commercial ammonium nitrate fertilizer (a saving of over US \$50 per hectare at the present world market price of the fertilizer). It was found that the marginal rate of return from shifting from "uninoculated" to "inoculated" treatment was about US \$100 for every dollar invested. Furthermore, use of legumes in a farming system improves the nitrogen economy, resulting in sustainable food production. To derive these benefits, it is essential that the legumes are supplied with the *Rhizobium* through normal inoculation of the legume seeds. The Government has established a laboratory devoted to biological nitrogen fixation (BNF), with scientific and technical staff, as well as a legume inoculant factory producing a wide range of *Rhizobium* inoculants for farmers. The factory currently produces about 100,000 packets annually, which the Government wishes to fully utilize. The planned increase of the factory's output is particularly intended for the small scale farmers who are not aware of the great potential of BNF by grain and pasture legumes for increasing crop and animal production. Although a well organized extension service exists, there have been very few demonstrations of inoculant use in the smallholder sector. This project responds to a national need identified in the Country Programme Framework. It aims at increasing awareness of inoculant technology and promoting its use by farmers through the extension service.

PROJECT PLAN: The project involves close collaboration between the Soil Productivity Research Laboratory (in charge of the BNF Laboratory), the Inoculant Production Factory, and the extension services (Agritex) of the Ministry of Lands, Agriculture and Rural Resettlement. The research and the extension units of the Ministry will be involved at all stages of the project, starting with planning. The first year of the project will be devoted to targeted (selected crops and areas) inoculation trial on farmers' fields to validate the response to inoculation, and establishment of a quality control protocol for the inoculants. These activities will require the use of N-15 isotope technique, and will involve both research and extension personnel to whom training will be provided as necessary.

Of particular importance will be the training of extension personnel on inoculant use. During the second year, large on-farm demonstration trials will be set up in the target areas to demonstrate to farmers the benefit of inoculation. Farmers will be fully involved in the planning and execution of the demonstration trials. They will be trained in the correct use of inoculants and to bridge the gap between the end users and research station. Farmers' days will be organized at the research station. Demonstration trials will be continued during the third year. Quality control will continue to be emphasized. Based on project results, simple extension material on inoculant use for farmers will be published. Throughout the project period, a constraint analysis of inoculant production and use will be made. The Government, with the assistance of the Agency where necessary, will carry out a socio-economic analysis of inoculant use to guide future actions.

NATIONAL COMMITMENT: Personnel for research and extension; laboratory facilities; inoculant production facilities; transportation; and operating costs.

AGENCY INPUT: Expertise in BNF in grain and pasture legumes and nitrogen turnover in cropping systems, and in inoculant production and use; equipment and supplies including N-15 labelled fertilizers; training; and sub-contract to partially cover the on-farm demonstration trials in collaboration with Agritex extension services.

PROJECT IMPACT: Increased yield is expected through the use of appropriate inoculants for economically important legumes and cropping systems in each ecological zone. Expansion of the use of rhizobial inoculants into the small scale farming sector will result in significant benefit and reduce expenditure on inorganic fertilizers.